THE CARBON PRINT

By
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CHICAGO
NEW YORK
LONDON

PRICE FIFTY CENTS

Simplicity Itself

The Carbon Print

A Treatise *for* Portrait Operators and Printers, and Miniature Painters

Modern Methods and Formulae

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Preface

THIS Treatise is put forward with a view to giving the reader—in a nutshell—a clear insight to the Carbon process, in simple language, revealing modern methods and formulas with such exacting detail, that failure to excel should be practically impossible.

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Chapter I.

The Process Outlined.

In this chapter I will endeavor to outline such detailed and lucid information that will enable the reader to grasp the actual chemical foundation of the Carbon Process; the most beautiful and most permanent known to photographic science.

Indeed, a well executed carbon print in the sepias or browns from, say a direct 16 x 20 negative—a portrait head, a negative yielding all those high qualities which modern portraiture permits, and we have a print which may well compete with a painting in oil.

The Carbon Process depends upon the fact that gelatine swells up in cold water, and dissolves in warm, but when it is mixed with a bichromate, and is exposed to light, it loses this property of dissolving in hot water and, to a great extent, that of swelling in cold water.

The Carbon Tissue.

The carbon tissue is simply a heavy, tough paper coated with a solution of gelatine, mixed with a carbon coloring matter, such as ivory black, Indian ink or any other permanent colors, such as the ferruginous reds, browns, etc.

The preparation of the tissue by hand is an undertaking far from practical. It is put upon the market in cut sizes, 5 x 7 or upwards, or in rolls 2½ x 12 feet. There are about fifty different shades of colors, some of the most used in portraiture being: red chalk, sepia, terra cotta, warm black, portrait brown, etc.

A chart representing the many shades can be obtained from the makers; it is a good thing to have, as the particular color best adapted to the work in hand can always be selected.

Action of Light

Having explained that carbon tissue is simply a heavy paper coated with a mixture of gelatine and some permanent coloring matter; also, that gelatine which dissolves in warm water, loses this property of dissolving when it is mixed with a bichromate and is exposed to light.

Therefore, if we take a piece of raw carbon tissue, sensitize it in a bath of bichromate of potassium, dry it, place it in contact with a negative in a printing frame in the usual way, and expose to light, we would find, *by our results later on,* that in those parts where the high-lights in the negative prevented the light from getting through to the sensitive tissue, the gelatine would wash away, together with the coloring matter in those parts.

On the other hand, where the light *did* get through, the gelatine would not dissolve. In this way we get the carbon print.

The shadows will be represented by a mixture of gelatine and coloring matter, the high-lights and half-tones in proportion to the amount of light which has penetrated.

Chapter II.

Directions for Sensitizing Carbon Tissue and Making a Single Transfer Print.

We will now sensitize a piece of carbon tissue, preparatory to printing it.

In winter months select a room in which a fire is burning, or is heated in some way, to a temperature of about 70° Fahr. The sensitizing bath is made up as follows:

Two ounces of potassium bichromate pure; place this in a one-quart jar and half fill with hot water. When the salts have dissolved (which can be hastened by stirring with a glass rod), add fifteen ounces of cold water, to which has been added ten drops of ammonia (gravity .880). Allow the bath to cool, then filter, when it will be ready for use, at a temperature of not below 50° or above 60° Fahr. (This can be filtered and used repeatedly, but the ingredients being so cheap, many expert workers make a new bath with each sensitizing.)

We will suppose that we are working with a sheet of tissue, size 8 x 10. A porcelain-lined tray, 10 x 12, will be required here, also a squeegee and a ferrotype sheet.

Pour the bichromate bath into the tray and immerse the tissue face up. The latter will curl somewhat, but can be kept under the solution by holding the corners down with the fingers (always use rubber stalls on the fingers while sensitizing); presently the tissue will straighten out and become limp; now turn it over in the bath, face down, removing air bells, if any, with a one-half-inch camel's-hair brush; turn it back, face up, when it will be ready for removal from the solution. Three minutes by the watch will be an average correct time

for immersion (a three-minute egg cooker makes a reliable, simple guide).

Remove by drawing the tissue over the side of the dish (the back against the rounded edge) to remove superfluous solution. The face of the tissue, the pigmented side, is placed on the ferrotype sheet, the latter having been rubbed over with French chalk and well rinsed with cold water. The squeegee is now applied to the back of the tissue, removing air and superfluous bichromate solution and, at the same time, pressing the tissue firmly into contact. Three or four firm sweeps with the squeegee, backward and forward, will suffice.

Now stand it away to dry, in an upright position, at an angle a little higher than the fireplace or radiator in the room, but not necessarily near them.

The tissue should dry, *if the conditions specified have been carried out,* in about four hours; it should not dry any quicker. On the other hand, if the drying is too slow, extending to ten hours, the tissue may be regarded as insoluble and useless.

If the sensitizing is done at night, it should be found stripped from the ferrotype sheet in the morning. Draw down the blinds in the drying room before retiring, to safeguard against the early morning light fogging the tissue.

This method of drying the carbon tissue on a ferrotype sheet, simplifies the Carbon Process to a very large extent for the beginner, or the expert, for that matter. It may be dried without fear of fogging in daylight, until, of course, it becomes detached from the ferrotype sheet.

When small quantities of tissue only are required, as for prints for miniature basis work, etc., this method of drying is undoubtedly a boon. The tissue, when dry,

comes away with a beautiful smooth surface, the finest film possible for contact printing.

There are also its scientific advantages; the film is protected, by being in contact with the ferrotype sheet, from warm, moist air and gas fumes. It offsets all chances of an atmosphere contaminated with noxious gases attacking the film.

Moreover, gelatine being of such complex chemical construction, it undergoes changes favorable to the carbon operation by drying in the manner described—drying by evaporation with the film side further from the air than the outer surface.

If the Carbon Process is to be carried on in large quantities, it will be necessary to have a special room for sensitizing and drying the tissue. This room is kept at an even heat of 70° Fahr. in winter; in summer, it will require no heating at all. Every gas jet must have a flue leading out of the room and arrangements made for the regular passing through it of a current of pure air.

The tissue is sensitized in the usual way (in solutions of larger volume, of course) and hung up on laths to dry, all surplus sensitizing solution being freed by removing the tissue from the bichromate bath to a zinc sheet and applying a large squeegee.

In these circumstances, the tissue will, of course, be dried in the dark. Let me here say that it is fatal to use the studio "dark room" for this purpose, or any other purpose connected with the Carbon Process.

Sensitizing in Hot Summer Months.

We proceed in exactly the same way as described for winter, but use a weaker bath and one made alkaline by carbonate instead of liquid ammonia.

Take one and one-half ounces potassium bichromate pure; dissolve in twenty ounces hot water. When cool, add twenty ounces cold water in which has been dissolved forty grains ammonia carbonate.

In hot months trouble may arise through the gelatine of the tissue dissolving away in the sensitizing bath; this is overcome by selecting the coolest room available and employing ice to keep the solution cool. Apply this by standing the bichromate bath inside a larger dish, the latter containing broken ice. In extreme cases it is best to sensitize late in the evening.

Chapter III.

Printing the Carbon Tissue.

Having sensitized the tissue, we place it in an air-tight tin, or between the leaves of a heavy book will suffice, for temporary purposes. Here we will require an "Actinometer" to measure the length of exposure, there being no visible change in the carbon tissue during the printing operation. We will make an actinometer which will answer all purposes for all time. Get, say, a one-ounce, round pill box; gum a disc of white paper on the lid and let it dry. Now gum a similar disc over the top of the other portion of the box. We now have a disc on the lid and one over the box itself, making a drum of the latter. Next, turn the lid upside down and puncture a hole about half an inch in diameter; cut a round piece of P. O. P. the shape of the box, place it on the disc, sensitized side up, and adjust the lid. We will have the P. O. P. showing through the hole in the lid. Take this out into the light and when that part of the P. O. P. showing through the half-inch hole assumes a pronounced color—a warm-toned color—stop the printing and paint the white disc of the lid with water-color, an exact imitation of the *tint* which has been reached. We now have a registered tint, which can always be obtained by simply matching in color the painted disc. A tint may be reached in a minute or an hour, according to the weather, but this is of no consequence whatever.

It remains to be found out how many tints are needed to print a carbon from a given sort of negative.

Averagely speaking, a well-balanced studio negative will require about two tints; a very dense negative four or more; a very thin, undertimed negative about one tint, or less.

A few trials will suffice to construct a satisfactory scale for the newly made actinometer.

When dealing with very thin, washy negatives, give the glass side a coating of matt varnish. This can be worked over in pencil if desired, and in dense parts it can be touched over with a brush dipped in bright mastic varnish, making them transparent. The next step is to provide a "Safe Edge" for the negative about to be used. This is simply an opaque mask placed on the borders of the negative to insure that the outside edges of the tissue are protected from light, and thus left in a soluble state. Black gummed strip paper answers and should be run around the sides of the negative, on the glass side.

We now place the masked negative into a printing frame, and place thereon, face down, a piece of sensitized carbon tissue, covering the "Safe Edge." Now put out to print (never print in direct sunlight); at the same time put out the actinometer, the latter, of course, having been filled with a fresh piece of P. O. P.; just as soon as the latter has assumed the color of the painted disc, one tint has been registered. Having gaged the negative, and printed the *required number of tints,* we prepare to develop the print.

Chapter IV.

Development of Single Transfer Prints.

Having printed to the desired number of tints, we remove the tissue from the frame, in subdued light. We now require a basis to which the printed film can be secured. "Transfer paper" is prepared commercially for this purpose. There are many kinds on the market, such as white, cream, toned, etc., or if we prefer to prepare our own, we use the following sizing formulae.

Take one ounce photographic gelatine, put this into a jar containing twenty ounces of cold water; allow it to soak one hour; then take a saucepan half filled with water, stand the jar with the gelatine in it, and put over a slow, steady heat. When nearly boiling, crush twenty grains of chrome alum and dissolve in one ounce of hot water; add this to the gelatine solution, drop by drop, stirring vigorously all the time to prevent precipitation. The selected paper is pinned to a drawing-board, and the warm chrome gelatine solution poured on to it; this is distributed and worked in with a fairly stiff brush.

If the selected paper is a rough kind, of the drawing paper variety it should receive three coats. With the thin, light weight papers, one coat will be sufficient and the solution can be put on with a sponge.

The paper is then allowed to dry thoroughly before using.

Unless preparing some heavy product, it is advisable to obtain and use the commercially prepared transfer papers, which, owing to the demand can be relied upon to be in ripe working condition.

With the transfer paper in readiness, take a 10 x 12 dish, filled to a depth of about one inch, with cold water; place the transfer paper in this, with the gelatine side

facing upwards. After an elapse of five minutes, the exposed carbon print is also immersed in the same dish. The latter will curl somewhat, but in a moment it will straighten out. When this has been accomplished, *immediately* slip a piece of glass under the transfer paper, raising it and quickly adjust the print in its center. We now have the gelatine side of the transfer paper and the pigmented face of the tissue together. In this condition they are removed and laid on the table and are squeegeed into close contact, the back of the tissue being uppermost. Apply the squeegee vigorously in all directions. The two adhering sheets are now placed between blotters, under a flat weight of about five pounds, for ten to fifteen minutes.

If the transfer paper is on the rough, heavy variety, use a weight of about twenty pounds and allow to stand fully thirty minutes; *also note,* such papers must receive a preparatory soaking of at least thirty minutes, in the cold-water bath, instead of five, as stated for thin papers.

The dish is now filled with warm water, about 90° Fahr., and the sandwiched tissue and paper removed from the blotters and placed therein, tissue, face up. Splash away any minute air bells accumulating on top.

Presently the pigmented gelatine matter will commence to oose out from the edges. When this has started and is fairly under way, *increase the temperature* by adding a little hot water. Now hold the corner of the transfer paper under the water, with the fingers of the left hand, and with those of the other hand, raise the corner of the tissue backing and gently peel it away from its dark, muddy bed.

If it does not peel away easily, allow a few seconds to pass, then commence to peel it from another corner.

When removed, you will have the paper backing in the right hand, which can be thrown away. Proceed by immediately splashing away all minute air bells. Now, place a glass underneath the print and raise it at an angle with one hand while splashing gently with the other. This will soon clear up the details of the image, and the dark gelatine mass disappears from it. When full detail has presented itself, go around the "Safe Edge," or borders of the print, with a piece of wet cotton wool to clear up the edges, then remove to a dish of cold water, or refill the same dish with water. Have ready here a bath composed of one ounce powdered alum, twenty ounces water. Place the print in this solution, face down, until the bichromate of potassium stain—a yellow tinge—has been completely removed.

Five minutes to one-half hour will be sufficient, as a rule. The print is now washed in water for a few minutes, and hung up by wooden clips to dry, thus completing the operation of *"Single Transfer."*

If your print has been overexposed, you will know this by the resistance offered in the stripping and development.

If underexposed, the first flow of warm water, after peeling, clears up the high-lights suddenly.

In such a case, reduce the temperature of your water immediately, and carry development on by simply rocking, instead of splashing, as described. It will happen that in negatives full of contrast, such as strong *Rembrant Lighted Subjects,* the high-lights will often present themselves quickly in development; in which case, heavy shadows can receive local treatment by delicate mopping with a piece of cotton wool dipped in hot water, returning the print, after each such operation, to the developing water of medium temperature.

Of course, with exceedingly. harsh, chalky negatives, the sensitized piece of tissue can be "flashed" in the light before printing it.

Carbon Prints on Porcelain, Opal, Glass, Etc.

Carbon prints on porcelain, opal, etc., can be made in exactly the same way as described in Single Transfer.

Indeed, printing by Single Transfer on the fine matt surfaces of porcelain or opal, which are so much admired, is actually the simplest form of Carbon Printing, and is undoubtedly the most suitable for the beginner.

Clean the ground matt surface free from grease, with water and whiting, and rinse thoroughly. Squeegee the print down on it, and proceed *exactly* as described for "Single Transfer." When developed and dried, these porcelain prints will be found to possess an exquisite delicacy and softness.

For greater security in making these prints, particularly large sizes, it is necessary to coat with the following formulae: Put the *whites* of three eggs into a cup and add one ounce of water, to which five drops of liquid ammonia have been added. Beat this to a froth and, when it has settled, filter, and apply a coating to the porcelain and stand away to dry in a dust-proof atmosphere.

This substratum is equally good for glass, lantern slides, etc.

When developing large prints on porcelain, glass, etc., it is advisable to start the temperature of the developing bath at about 80° Fahr. instead of 90°, and increase the temperature gradually to 90° just before stripping.

Chapter V.

The Double Transfer Process.

In the Single Transfer print, we have the image reversed as regards right and left. In most cases this will not matter, but when it is undesirable it is necessary to turn the image-bearing film. We must either print from a reversed negative, made by reversing the negative in the camera, and exposing through the glass side, allowing, of course, for the thickness of the glass when focusing, or adopt the *Double Transfer Process;* the latter simply means that development of the print must be performed while the pigmented gelatine print is on a Temporary Support, this support being coated with a waxing compound upon which the print is developed, and subsequently it is brought into contact with a gelatine-bedded basis, called the "Final Support." The print, being itself gelatine, cements to the final support and is released by the wax from the first or Temporary Support. Thus we get the image reversed, as desired, having executed the Process of *"Double Transfer."*

Waxing the "Temporary Support."

This operation is very simple. Take a piece of Temporary Support, which can be obtained in stock sizes, and proceed to give it a very delicate film of wax. The ready prepared waxing compound obtainable, ready for use, is the one recommended. (It is not worth the trouble of making by hand, and can be purchased in the convenient form of cakes.)

Pour about one-half of a teaspoonful of turpentine on a pad made of old, soft cotton flannel; rub this on the wax cake, then apply it to the "Temporary Support,"

smearing it all over. Having conveyed the wax to the Temporary Support, in the manner described, we allow it to stand for from twenty to thirty minutes, during which time the evaporation of the turpentine will be complete.

Now, make a second pad from old, soft flannel; with this gently polish the waxed "temporary support" with a circular motion—on no account must the polishing be attempted until the waxed surface is thoroughly dry—this done, the support is ready.

Care must be observed not to take too much wax to the Temporary Support during the waxing operation; at the same time, if too little is conveyed, the support will be deprived of its stripping qualities, through lack of wax film.

The "Temporary Support" (which should be larger than the print and increased in size, as width of margin to the finished print is desired) is now immersed into cold water, followed by the printed tissue, and the two undergo exactly the same treatment as was described for "Single Transfer."

Having developed and dried the print, on the temporary support, in the usual way, we have the picture, perfect and complete, excepting that it is reversed, as regards left and right. To complete the operation of "Double Transfer," the print has to be attached, or cemented, to a new or Final Support, and stripped from the waxed one to which it has been developed.

"Final Support" can be prepared by hand, but this is a long undertaking, and by no means practical when we consider that the commercially prepared papers are put on the market in cut sizes, rolls, etc. For preparing any particular kind of paper, however, the following coating is to be applied:

Take one ounce photographic gelatine; soak this in eight ounces of cold water for one hour; then apply a gentle, steady heat to dissolve it. Add, stirring well, three grains chrome alum, which has been dissolved in one ounce of hot water.

This chrome gelatine solution is now applied to the paper in its warm state; two coats should be given. After the first coating, hang the paper to dry, which should be thorough and fairly rapid.

Just previous to using it, the paper should get a second coat, and, while it is still wet, the print placed down on it in the manner described for "Double Transfer."

Returning to the print developed on the waxed temporary support, we will proceed to transfer it to the Final Support. Cut a piece of Final Support, slightly larger than the print, and place it, face up, in a tray of *cold water* for a few minutes. In the meantime, immerse the print on the temporary support, into a tray of *warm water about 90° Fahr.* As soon as the latter assumes a limp state, remove the "Final Support" from the cold bath into the warm, where you have also the print.

In a few seconds the gelatine face of the "Final Support" will become soft and flimsy to the touch. At this point, *immediately* bring the gelatine face of the support in contact with the face of the print (avoiding air bells); remove to a table and squeegee into contact, with light but even sweeps, and hang up to dry.

It is most important that the drying is absolutely thorough, when, providing the waxing process has been properly performed, the print will easily be scaled from its temporary support, completing the process of "Double Transfer."

If there is difficulty in stripping the "Final Support" from the print, insufficient wax was used, or it was polished too much, thereby removing the wax film.

If the "Final Support" comes away without the print, this has been caused by having the water too hot when the transfer was performed, which means that the gelatine surface of the "Final Support" dissolved away.

If there are bright specks in the high-lights of the print, the water for softening the transfer was not hot enough. This is particularly liable with "stale" transfer papers, which require quite hot water to render the gelatine flimsy to the touch.

If there is a shining appearance in parts of the finished print, this has been caused by too little pressure with the squeegee during final transfer.

If large blisters are encountered during development on the "Temporary Support," too much wax has been conveyed, or the developing was carried on at a temperature above that recommended.

Carbon Prints on Ivory. For Miniature Painters, Etc.

For years the author has made a specialty of the basis print on ivory for miniature painters.

Considering the simplicity of the process, as here revealed, it seems extraordinary the high prices these little basis prints command.

When ivory is a basis for a carbon print, it must be made by the "Double Transfer Process," for, if potassium bichromate is brought into contact with ivory, it leaves a stain very difficult to remove, and, in consequence, will, to a great extent, undermine the durability of a painted miniature executed thereon. The following are the actual methods and formulae adopted by the writer in making carbon prints on ivory.

The selected ivory is put into cold water for an hour to soak; the smooth side is then cleaned thoroughly with French chalk, well rinsed and allowed to dry. The rough side of the ivory can be marked with a pencil, enabling the operator to distinguish quickly the prepared side.

Take one-half ounce transparent gelatine (Nelson's No. 1 preferred). Cut the gelatine up and put it into a jar containing eight ounces cold water (distilled); allow this to soak one hour. Now place the jar in a saucepan, half filled with water, and dissolve the gelatine by gradually bringing to a boil with slow heat. Crush six grains chrome alum and dissolve in one ounce warm water; add the latter to the warm gelatine, drop by drop, stirring vigorously to prevent precipitation, which will result if the stirring is omitted, or if the alum is added too rapidly.

Now take the miniature print, which has been developed on its waxed "Temporary Support" (Sawyer's Temporary Support is the one recommended), and place

it in a tray of warm water, 80° Fahr.; in a minute or two it will become limp; at this point take the piece of dry ivory in the fingers of one hand, lift the print from the warm water with the other hand, and immerse both into the warm gelatine solution, drawing them out in contact; adjust quickly and squeegee, then hang up to dry.

When thoroughly bone dry, they will readily scale apart; any streaks or marks of wax can be removed by gently rubbing the print with a tuft of cotton dipped in benzine.

The "Temporary Support" can now be placed away between tissue papers for future use. (Generally speaking, it will yield two or three transfers before requiring to be rewaxed.)

If sparkling spots present themselves in the finished print, these are caused by insufficient squeegeeing. Hold the print before the spout of a steaming kettle, at a distance to very delicately sweat the gelatine print, then hang up to dry; when dry the spots which were in evidence will have melted to the film and have disappeared. Great care must be observed; if the steaming is carried too far, the print will be destroyed.

Always start the transfer of a print as quickly as possible after it has set or dried on the "Temporary Support." When inconvenient to do so, place the print in a damp place until it is required for transfer to the "Final Support."

Miniature prints, *intended* for transfer to ivory, should not remain any *undue* length of time in the alum bath, but should be removed and rinsed in water, with the aid of a piece of wet cotton wool, as soon as all trace of bichromate stain has disappeared. Undue aluming tends to chill the film and hinder successful transfer to ivory. If the miniature print springs from its "Temporary Support" while drying thereon, it was dried at too high a temperature, or too much wax was put on the temporary support.

Two-Color Prints.

Magnificent miniature effects can be obtained by developing two colors to one basis. The border designs, such as the antique ring effects, now so much in vogue, offer inducements for this very pretty print, which is extremely simple by the "Single Transfer" process on porcelain, imitation ivory, celluloid, etc. In using ivory as the basis, of course, "Double Transfer" is necessary.

Make a miniature negative from a border design, such as the antique ring designs mentioned.

Block out in the usual way (as required for ordinary double printing); make a print, say in sepia and develop and dry as described for "Single Transfer." Now make a print, say in red chalk, masking with the oval cut-out from which the *center disc* was made (used in the design print). Take a lantern-slide glass, center it on the oval cut-out, and mark around the four sides with white ink. Cut the piece of sensitized tissue the exact size of the lantern-slide glass and proceed by putting a glass in the printing frame; lay the cut-out on it, *ruled side up*, and put down your miniature negative; gage and fill in the tissue, adjusting accordingly. Now place the lantern-slide glass on the dry design print, center accurately and mark at each corner with a dot of white water-color paint. Proceed by developing the second print on top of the first, gaging correctly, as directed for "Single Transfer."

It is advisable to use the formulae, which was recommended for *coating* porcelain, etc., in a previous chapter.

Large work made by the same method, or by "Double Transfer" process, results in magnificent prints, which should well command a high price.